<u>**AMENDMENTS TO THE CLAIMS**</u>

The listing of claims will replace all prior versions and listings of claims in the application:

1. **(Currently Amended)** A method for estimating a charge/discharge electricity amount of a secondary battery comprising:

a step of measuring a pair of data consisting of a current flowing through the secondary battery and a terminal voltage of the secondary battery corresponding to the current, thus obtaining a plurality of pairs of data,

a step of, ~~in the case that~~ <u>when</u> specific selection conditions are satisfied, calculating a no-load voltage as a voltage intercept at a current of zero in a straight-line approximation obtained by statistical processing with respect to the plurality of pairs of data,

a step of, ~~in the case that~~ <u>when specific selection conditions are not satisfied and one of</u> specific current conditions ~~or~~ <u>and</u> voltage conditions continue to be met for a certain amount of time, calculating an open circuit voltage from the terminal voltage of the secondary battery,

a step of calculating a charge (ΔV_b) in the no-load voltage or the open circuit voltage over a predetermined period of time, and

a step of calculating an estimated charge/discharge electricity amount (ΔQ_e) of the secondary battery based on the change in the no-load voltage or the open circuit voltage.

2.   **(Currently Amended)**   The method for estimating a charge/discharge electricity amount of a secondary battery according to claim 1, further comprising:

a step of setting in advance an adjustment constant (ΔV_{bc}) and adjustment coefficient (K_b), for the change in the no-load voltage or the open circuit voltage (ΔV_b), that are determined depending on ~~the~~ physical properties and ~~the~~ a state of charging or discharging of the secondary battery,

a step of setting in advance an electromotive force change constant (K_{eq}), which is a change in an electromotive force with respect to [[the]] a charge/discharge electricity amount in an usable domain ~~of state of charge~~, that is determined depending on the physical properties and the state of charging or discharging of the secondary battery, and

a step of setting in advance a polarization voltage generation constant (K_{pol}), which is a change in a polarization voltage with respect to the charge/discharge electricity amount in the usable domain ~~of state of charge~~, that is determined depending on the physical properties and the state of charging or discharging of the secondary battery,

wherein the estimated charge/discharge electricity amount ΔQ_e is calculated as a function of the change in the no-load voltage or the open circuit voltage ΔV_b using an equation expressed as:

$$\Delta Q_e = K_b \times (\Delta V_b + \Delta V_{bc})/(K_{eq} + K_{pol}).$$

3. **(Withdrawn)**   The method for estimating a charge/discharge electricity amount of a secondary battery according to claim 1, further comprising:

a step of calculating a measured charge/discharge electricity amount over the predetermined period of time from the current flowing through the secondary battery,

a step of calculating a polarization voltage of the secondary battery based on the measured charge/discharge electricity amount, and

a step of calculating an electromotive force of the secondary battery based on the measured charge/discharge electricity amount,

a step of calculating a change in the polarization voltage and a change in the electromotive force over the predetermined period of time,

wherein in the step of calculating the estimated charge/discharge electricity amount, the estimated charge/discharge electricity amount is calculated based on the change in the polarization voltage, the change in the electromotive force and the change in the no-load voltage or the open circuit voltage.

4. **(Withdrawn)**   The method for estimating a charge/discharge electricity amount of a secondary battery according to claim 3,

wherein the step of calculating the estimated charge/discharge electricity amount comprises a step of calculating a compensation coefficient with respect to the measured charge/discharge electricity amount based on the change in the polarization voltage, the change in the electromotive force and the change in the no-load voltage or the open circuit voltage, and the estimated charge/discharge electricity amount is calculated by multiplying the measured charge/discharge electricity amount by the compensation coefficient.

5. **(Withdrawn)**   The method for estimating a charge/discharge electricity amount of a secondary battery according to claim 4,

wherein when ΔV_{pol} is the change in the polarization voltage, ΔV_{eq} is the change in the electromotive force, ΔV_b is the change in the no-load voltage or the open circuit voltage, and α is the compensation coefficient, the compensation coefficient α is expressed as:

$$\alpha = \Delta V_b / (\Delta V_{pol} + \Delta V_{eq}).$$

6. **(Withdrawn)**   The method for estimating a charge/discharge electricity amount of a secondary battery according to claim 3,

wherein in the step of calculating the polarization voltage, the polarization voltage is calculated based on the measured charge/discharge electricity amount and the polarization voltage calculated based on the estimated charge/discharge electricity amount calculated the predetermined amount of time previously.

7. **(Withdrawn)** The method for estimating a charge/discharge electricity amount of a secondary battery according to claim 3,

wherein in the step of calculating the electromotive force, the electromotive force is calculated based on the measured charge/discharge electricity amount and the electromotive force calculated based on the estimated charge/discharge electricity amount calculated the predetermined amount of time previously.

8. **(Withdrawn)** The method for estimating a charge/discharge electricity amount of a secondary battery according to claim 3,

wherein in the step of calculating the polarization voltage, the polarization voltage is calculated with reference to a polarization voltage-charge/discharge electricity amount characteristic prepared in advance with temperature as a parameter.

9. **(Withdrawn)** The method for estimating a charge/discharge electricity amount of a secondary battery according to claim 3,

wherein in the step of calculating the electromotive force, the electromotive force is calculated with reference to an electromotive force-state of charge characteristic prepared in advance with temperature as a parameter, based on the sum of the measured charge/discharge electricity amount and the state of charge calculated the predetermined amount of time previously.

10. **(Currently Amended)** A method for estimating a polarization voltage of a secondary battery, comprising:

~~a step of calculating an estimated charge/discharge electricity amount using the method for estimating a charge/discharge electricity amount of a secondary battery according to claim 1, and~~

a step of measuring a pair of data consisting of a current flowing through the secondary battery and a terminal voltage of the secondary battery corresponding to the current, thus obtaining a plurality of pairs of data,

a step of, when specific selection conditions are satisfied, calculating a no-load voltage as a voltage intercept at a current of zero in a straight-line approximation obtained by statistical processing with respect to the plurality of pairs of data,

a step of, when specific selection conditions are not satisfied and one of specific current conditions and voltage conditions continue to be met for a certain amount of time, calculating an open circuit voltage from the terminal voltage of the secondary battery,

a step of calculating a charge (ΔV_h) in the no-load voltage or the open circuit voltage over a predetermined period of time,

a step of calculating an estimated charge/discharge electricity amount (ΔQ_e) of the secondary battery based on the change in the no-load voltage or the open circuit voltage, and

a step of recalculating a polarization voltage of the secondary battery based on the estimated charge/discharge electricity amount.

11.   **(Currently Amended)**   A method for estimating a state of charge of a secondary battery, comprising:

~~a step of calculating an estimated charge/discharge electricity amount using the method for estimating a charge/discharge electricity amount of a secondary battery according to claim 1, and~~

a step of measuring a pair of data consisting of a current flowing through the secondary battery and a terminal voltage of the secondary battery corresponding to the current, thus obtaining a plurality of pairs of data,

a step of, when specific selection conditions are satisfied, calculating a no-load voltage as a voltage intercept at a current of zero in a straight-line approximation obtained by statistical processing with respect to the plurality of pairs of data,

a step of, when specific selection conditions are not satisfied and one of specific current conditions and voltage conditions continue to be met for a certain amount of time, calculating an open circuit voltage from the terminal voltage of the secondary battery,

a step of calculating a charge (ΔV_{h}) in the no-load voltage or the open circuit voltage over a predetermined period of time,

a step of calculating an estimated charge/discharge electricity amount (ΔQ_{e}) of the secondary battery based on the change in the no-load voltage or the open circuit voltage, and

a step of calculating a state of charge of the secondary battery based on the estimated charge/discharge electricity amount.

12.   **(Currently Amended)**   An apparatus for estimating a charge/discharge electricity amount of a secondary battery, comprising:

a current measurement part that measures current flowing through the secondary battery as current data,

a voltage measurement part that measures a terminal voltage of the secondary battery as voltage data,

a no-load voltage calculation part that obtains a plurality of pairs of data consisting of current data from the current measurement part and voltage data corresponding to this current data from the voltage measurement part, and that, ~~in the case that~~ when specific selection conditions are satisfied, calculates a no-load voltage as a voltage intercept at a current of zero in a straight-line approximation obtained by statistical processing with respect to the plurality of pairs of data,

an open circuit voltage calculation part that, ~~in the case that~~ when specific selection conditions are not satisfied and one of specific current conditions ~~or~~ and voltage conditions continue to be met for a certain amount of time, calculates an open circuit voltage from the terminal voltage of the secondary battery,

a charge-in-measured-voltage calculation part that calculates a change (ΔV_b) in the no-load voltage or the open circuit voltage over a predetermined period of time, and

an estimated charge/discharge electricity amount calculation part that calculates an estimated charge/discharge electricity amount (ΔQ_e) of the secondary battery based on the change in the no-load voltage or the open circuit voltage.

13. **(Currently Amended)** The apparatus for estimating a charge/discharge electricity amount of a secondary battery according to claim 12, further comprising:

a change-in-voltage adjustment constant/adjustment coefficient setting part that sets in advance a change-in-voltage adjustment constant (ΔV_{bc}) and an adjustment coefficient (K_b) for the change in the no-load voltage or the open circuit voltage (ΔV_b) that are determined depending on ~~the~~ physical properties and [[the]] a state of charging or discharging of the secondary battery,

a change-in-electromotive-force constant setting part that sets in advance a change-in-electromotive-force constant (K_{eq}), which is a change in an electromotive force with respect to [[the]] a charge/discharge electricity amount in an usable domain ~~of state of charge~~, that is determined depending on the physical properties and the state of charging or discharging of the secondary battery, and

a polarization voltage generation constant setting part that sets in advance a polarization voltage generation constant (K_{pol}), which is a change in a polarization voltage with respect to the charge/discharge electricity amount in the usable domain ~~of state of charge~~, that is determined depending on the physical properties and the state of charging or discharging of the secondary battery,

wherein the estimated charge/discharge electricity amount calculation part calculates the estimated charge/discharge electricity amount ΔQ_e as a function of the change in the no-load voltage or the open circuit voltage ΔV_b using an equation expressed as:

$$\Delta Q_e = K_b \times (\Delta V_b + \Delta V_{bc})/(K_{eq} + K_{pol}).$$

14. **(Withdrawn)** The apparatus for estimating a charge/discharge electricity amount of a secondary battery according to claim 12, further comprising:

a measured charge/discharge electricity amount calculation part that calculates a measured charge/discharge electricity amount over the

predetermined period of time from the current flowing through the secondary battery,

a polarization voltage calculation part that calculates a polarization voltage of the secondary battery based on the measured charge/discharge electricity amount, and

an electromotive force calculation part that calculates an electromotive force of the secondary battery based on the measured charge/discharge electricity amount,

a change-in-polarization-voltage calculation part that calculates a change in the polarization voltage over the predetermined period of time, and

a change-in-electromotive-force calculation part that calculates a change in the electromotive force over the predetermined period of time,

wherein the estimated charge/discharge electricity amount calculation part calculates the estimated charge/discharge electricity amount based on the change in the polarization voltage, the change in the electromotive force and the change in the no-load voltage or the open circuit voltage.

15. **(Withdrawn)** The apparatus for estimating a charge/discharge electricity amount of a secondary battery according to claim 14,

wherein the estimated charge/discharge electricity amount calculation part comprises a compensation coefficient calculation part that calculates a compensation coefficient with respect to the measured charge/discharge electricity amount based on the change in the polarization voltage, the change in the electromotive force and the change in the no-load voltage or the open circuit voltage, and the estimated charge/discharge electricity amount is calculated by multiplying the measured charge/discharge electricity amount by the compensation coefficient.

16. **(Withdrawn)** The apparatus for estimating a charge/discharge electricity amount of a secondary battery according to claim 15,

wherein when ΔV_{pol} is the change in the polarization voltage, ΔV_{eq} is the change in the electromotive force, ΔV_b is the change in the no-load voltage or the open circuit voltage, and α is the compensation coefficient, the compensation coefficient α is expressed as:

$$\alpha = \Delta V_b / (\Delta V_{pol} + \Delta V_{eq}).$$

17. **(Withdrawn)**   The apparatus for estimating a charge/discharge electricity amount of a secondary battery according to claim 14,

wherein the polarization voltage calculation part calculates the polarization voltage based on the measured charge/discharge electricity amount and the polarization voltage calculated based on the estimated charge/discharge electricity amount calculated the predetermined amount of time previously.

18. **(Withdrawn)**   The apparatus for estimating a charge/discharge electricity amount of a secondary battery according to claim 14,

wherein the electromotive force calculation part calculates the electromotive force based on the measured charge/discharge electricity amount and the electromotive force calculated based on the estimated charge/discharge electricity amount calculated the predetermined amount of time previously.

19. **(Withdrawn)**   The apparatus for estimating a charge/discharge electricity amount of a secondary battery according to claim 14, further comprising:

a temperature measurement part that measures a temperature of the secondary battery as temperature data,

wherein the polarization voltage calculation part calculates the polarization voltage with reference to a polarization voltage-charge/discharge electricity amount characteristic prepared in advance with the temperature data from the temperature measurement part as a parameter.

20. **(Withdrawn)**   The apparatus for estimating a charge/discharge electricity amount of a secondary battery according to claim 14, further comprising:

a temperature measurement part that measures a temperature of the secondary battery as temperature data,

wherein the electromotive force calculation part calculates the electromotive force with reference to an electromotive force-state of charge characteristic prepared in advance with the temperature data from the temperature measurement part as a parameter, based on the sum of the measured charge/discharge electricity amount and the state of charge calculated the predetermined amount of time previously.

21. **(Currently Amended)** An apparatus for estimating a polarization voltage of a secondary battery, comprising:

a current measurement part that measures current flowing through the secondary battery as current data,

a voltage measurement part that measures a terminal voltage of the secondary battery as voltage data,

a no-load voltage calculation part that obtains a plurality of pairs of data consisting of current data from the current measurement part and voltage data corresponding to this current data from the voltage measurement part, and that, when specific selection conditions are satisfied, calculates a no-load voltage as a voltage intercept at a current of zero in a straight-line approximation obtained by statistical processing with respect to the plurality of pairs of data,

an open circuit voltage calculation part that, when specific selection conditions are not satisfied and one of specific current conditions and voltage conditions continue to be met for a certain amount of time, calculates an open circuit voltage from the terminal voltage of the secondary battery,

a charge-in-measured-voltage calculation part that calculates a change (ΔV_b) in the no-load voltage or the open circuit voltage over a predetermined period of time, and

an estimated charge/discharge electricity amount calculation part that calculates an estimated charge/discharge electricity amount (ΔQ_e) of the secondary battery based on the change in the no-load voltage or the open circuit voltage, and

a polarization voltage recalculation part that recalculates a polarization voltage of the secondary battery based on the estimated charge/discharge electricity amount ~~calculated by the apparatus for estimating a charge/discharge electricity amount of a secondary battery according to claim 12~~.

22. **(Currently Amended)** An apparatus for estimating a state of charge of a secondary battery, comprising:

a current measurement part that measures current flowing through the secondary battery as current data,

a voltage measurement part that measures a terminal voltage of the secondary battery as voltage data,

a no-load voltage calculation part that obtains a plurality of pairs of data consisting of current data from the current measurement part and voltage data corresponding to this current data from the voltage measurement part, and that, when specific selection conditions are satisfied, calculates a no-load voltage as a voltage intercept at a current of zero in a straight-line approximation obtained by statistical processing with respect to the plurality of pairs of data,

an open circuit voltage calculation part that, when specific selection conditions are not satisfied and one of specific current conditions and voltage conditions continue to be met for a certain amount of time, calculates an open circuit voltage from the terminal voltage of the secondary battery,

a charge-in-measured-voltage calculation part that calculates a change (ΔV_b) in the no-load voltage or the open circuit voltage over a predetermined period of time, and

an estimated charge/discharge electricity amount calculation part that calculates an estimated charge/discharge electricity amount (ΔQ_e) of the secondary battery based on the change in the no-load voltage or the open circuit voltage, and

a state of charge calculation part that calculates a state of charge of a secondary battery based on the estimated charge/discharge electricity amount ~~calculated by the apparatus for estimating a charge/discharge electricity amount of a secondary battery according to claim 12~~.